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United States Department of Agriculture,

BUREAU OF PLANT INDUSTRY,

Farmers' Cooperative Demonstration Work,

WASHINGTON, D. C.

FIELD INSTRUCTIONS FOR FARMERS' COOPERATIVE DEMONSTRATION WORK.

In the Farmers' Cooperative Demonstration Work great stress is laid upon a more thorough preparation of the soil in the autumn, because in our southern climate the soils do not freeze sufficiently deep to open them and admit air and moisture. We must, therefore, do by plowing in the fall and by some winter cultivation what nature does in the colder North.

In the richest soils there is but little food ready prepared for the plant, and nature's plan is that this food shall be prepared more or less daily by the aid of the air, the moisture in the soil, and the sun and germ action.

These four active forces cause the food to be prepared so that the plant can be properly nourished. This can not be done without plowing and cultivating to admit the air, and the earlier this work is commenced in the fall the greater the effect it will have upon the crop of the following season.

The effect of using good seed is not sufficiently appreciated, nor perhaps is it understood just what makes good seed. It must be the best variety, carefully selected early in the fall, and stored in a dry place.

Young plants require excellent cultivation, just as young animals require the best food and care.

The judicious use of commercial fertilizer is one of the most important matters in modern agriculture, for the fertilizer furnishes plant food directly and indirectly to the young plants.

Emphasis is placed on the use of a winter cover crop of oats, barley, rye, vetch, or crimson clovers as may be best suited to local conditions and climate. Keeping the soil constantly occupied in the production of something valuable for food or fertilizer is better than to allow it to leach, wash, or sunbake.

The most important factor relating to the permanent fertility of the soil is the abundant and judicious use of all the animal and vegetable matter that may be found on every farm, such as barnyard manure, leaf mold, and green crops. For soil building we must largely depend upon barnyard manure, the compost heap, and leguminous plants, such as cowpeas, soy beans, vetches, and the clovers.

THE COTTON CROP.

FALL PREPARATION OF THE FIELD.

For the best results the field should be plowed in the early fall or winter on most soils, not later than December 1, and earlier if possible.

If the farmer uses an ordinary plow, then the fall plowing (breaking) should be 1 or 2 inches deeper than usual and the furrows should be set on edge. If a disk plow can be secured, use it and plow as deep as possible. Full directions for preparing the seed bed for cotton and corn are given in Circular No. "A"-68, entitled "Fall-Breaking and the Preparation of the Seed Bed."

Disk or harrow thoroughly before planting. Tillage is manure. The soil gets air by stirring, and plant food which could not otherwise be used by the growing crop becomes available.

Most plants first throw out their feeding roots in the warm surface soil if finely pulverized, and it is best, therefore, immediately before planting, to use a section or disk harrow, shallower than the plowing.

Time spent in making a good seed bed is not wasted. Go over the field several times with the harrow, if necessary.

Plant as early as is safe from frost. The actual date of planting depends on the locality. The important point is to plant as early as the weather and the soil conditions permit quick germination and growth. More stands are lost by too early planting than by waiting till the weather and soil are warm. Nothing is gained by planting before the soil has become warm enough for the seed to germinate and the plant to make rapid growth.

Whether it is best to flat plant or plant on a bed is a question so wholly local that every farmer must determine it for himself.

Depth of planting is a similar problem, dependent upon the soil, season, rainfall, climate, etc. Usually shallow planting is best. The tendency is to plant too deep.

SPACING AND CULTIVATION.

With rich soil more space will be required between the rows; with thinner soil, less.

The general rule for spacing rows is that the distance between the rows shall be a little more than the height of the cotton on the land in average years. Where cotton usually grows 2 or 3 feet high the rows should be from $3\frac{1}{2}$ to 4 feet apart. Where cotton normally grows about $3\frac{1}{2}$ feet high plant in rows 4 feet apart. Where it grows 4 or 5 feet high put the rows 5 feet apart. It is better to have the spaces between the rows a little too wide than too narrow. Air and sunlight are of the greatest importance in pushing the crop to maturity.

Plant early-maturing varieties of cotton. Some of the large boll varieties are preferable for uplands. This is particularly true in the western and northern portions of the cotton belt and under boll-weevil conditions. Under boll-weevil conditions on the alluvial lands

in sections of heavy rainfall small or medium boll varieties with light foliage have given best results.

If fertilizers are used, the following general rule should govern: On rich lands use mainly fertilizers that will stimulate the fruit and not the stalk growth. On lighter lands use more of the elements to force growth, combined with others which will mature the fruit.

High-grade acid phosphate, not less than 14 per cent available, may be considered a basis for increasing fruit and hastening maturity of crops. Even on the richest land it has been demonstrated that a small percentage of nitrogen added to the acid phosphate gives better results. For fairly rich soils mix 3 parts of acid phosphate and 1 part of cottonseed meal.

A mixture of 1 part of cottonseed meal to 2 parts of high-grade acid phosphate will greatly increase the growing condition and will be better for medium soils.

On thin or impoverished soils equal quantities of cottonseed meal and acid phosphate can be used to advantage.

In case the foregoing can not be obtained standard-grade commercial fertilizers may be used. These should contain in the mixture not less than 8 to 10 per cent of available phosphoric acid and 2 to 3 per cent of nitrogen. Usually 1 to 2 per cent of potash is sufficient, but in some sections more may be used with profit. On fresh lands or lands where a heavy crop of peas, beans, or clover has been turned under, a high-grade (14 per cent) acid phosphate may be used alone.

On black waxy lands the use of commercial fertilizers is usually not advisable.

Where lands are greatly worn by years of cropping it is better to raise some green crop upon them, such as rye or buckwheat, and turn it under for renovation of the soil.

Air-slaked lime is of value for use on stiff or gummy soils, to loosen them up, permit the air to enter, and prevent a sour condition of such soils when too wet.

The beneficial effect of commercial fertilizers depends largely upon the presence of humus in the soil; hence the importance of using stable manure and plowing under green crops.

In applying the foregoing instructions the farmer must use considerable judgment and modify his practice when necessary to fit local conditions.

HOW TO APPLY THE FERTILIZER AFTER THE SOIL HAS BEEN THOROUGHLY PULVERIZED.

In the absence of a good machine apply the fertilizer as follows:

Mark out the rows or bed up,¹ spacing as before stated, and distribute the fertilizer in rows. Follow with a shallow bull tongue,

¹ Bedding up land is a precaution against a heavy rainfall after planting. In sections where there is no danger from excessive moisture, flat planting is preferred, and in some cases it may be necessary to plant a few inches below the surface. Seeds must have moisture, but they must be kept out of standing water in the soil.

or scooter, to thoroughly mix the fertilizer with the soil. The fertilizer should be distributed several days before planting, as there is danger of injuring the seed if brought in immediate contact with strong fertilizer. A very careful mixing of the fertilizer with the soil is necessary for the same reason. On most soils the judicious use of commercial fertilizers is advisable. On black waxy land and some other soils stable manure and the turning under of green crops seem to give the best results.

Where lime is needed, use about 1 ton of caustic lime per acre. Haul into the field and put in small piles, and leave until air-slaked, then scatter broadcast and mix thoroughly with the soil. Where ground limestone is used, apply 2 tons per acre broadcast, mixing thoroughly with the soil.

Use a section harrow thoroughly before and after planting where practicable.

Begin cultivation as soon as the cotton is up. A section harrow or weeder will do splendid work to loosen the surface soil at this time. Where practicable, it will be found best to drive at right angles to the row.

The first cultivation after the harrow may be deep, the later cultivations should be shallow. On rich or alluvial soils, especially under boll-weevil conditions, the tendency of the plant is to grow too rank and deep cultivation should be continued until the cotton begins to set squares freely, after which only shallow cultivation should be practiced.

Cultivating every 7 to 10 days, weather and soil conditions permitting, will be best. This allows on an average nine cultivations. All our instructions are based upon the theory that the intelligent farmer has not allowed his crop to become grassy. If this is unavoidable, owing to continuous rains, the cotton should be cleared of grass and weeds as soon as possible and then the shallow cultivation continued as before. For shallow cultivation in a cornfield when the corn is not too tall, the weeder stands first, but a narrow-wing sweep does good work if the dirt is allowed to fall loosely over it.

DEPTH OF CULTIVATION.

If soil has been prepared as we direct, it generally contains sufficient moisture for cotton. The safe advice is to cultivate shallow and to let the roots have all the space possible for feeding. The unsafe advice is to break shallow and to cultivate deep. In regions of light rainfall or of semiarid condition a deeper mulch may be found advisable.

It may be advisable sometimes to chop or thin cotton twice, leaving it thicker at first than necessary and afterwards thinning to the proper stand for the soil. The distance between plants in the rows,

however, must be determined by the usual growth of plants on such soil. It is our opinion, based on extensive tests, that cotton may be planted in hills properly spaced, so as to avoid most of the chopping out. A good seed bed and excellent seed are required.

MEASURES NECESSARY UNDER BOLL-WEEVIL CONDITIONS.

As soon as cotton can be gathered, if the stalks are still green and growing, kill all unhatched weevils in squares and immature bolls, and at the same time deprive the adult weevils of food and breeding grounds by immediately cutting and burning all the cotton stalks.

The earlier this can be done the better. Where a sufficient number of cattle can be turned into the field to eat it clean in a few days this may be done, instead of cutting and burning the stalks.

The burning of the stalks while the cotton is green destroys a vast number of adult weevils, and hence is advisable in all weevil-infested fields, provided it is done early. If it is impossible to pick the cotton out before a heavy frost has killed the larvæ in the punctured squares and destroyed all weevil food, then in sections of considerable winter rainfall the stalks may be cut and plowed under, but care must be taken to have the stalks completely covered and turned as deeply as possible.

It is seldom practicable for farmers in the northern portion of the cotton belt to cut and burn stalks early enough to be of value.

Burn all grass and rubbish on the ditches and borders of the field in the winter.

When squares begin to drop from the plant, it may be due either to the weevil or to other insects, or possibly to other conditions. In any case it is well to collect and burn all the squares that drop for at least the first month after the squares commence to fall, and it will be wise to continue this for a longer period. A good many weevils will thus be destroyed.

PRACTICE TO BE FOLLOWED AS SOON AS THE COTTON PLANTS BEGIN TO PUT ON SQUARES.

Look for the boll weevil and other injurious insects.

All cultivation from this time should be shallow. Deep cultivation is liable to cause more or less injury, except in case of continuous rains.

Continue the cultivation as late as possible, being governed by the size of the plant.

If the boll weevil appears, attach a smooth pole or brush to the cultivator handles in such a way as to strike the cotton plants and knock off the punctured squares. This, with the picking up of the squares, is of great importance. Avoid covering up fallen squares by picking them up ahead of the cultivator, as the weevils will hatch out more readily in the moist soil, where they are out of reach of

the hot rays of the sun. By attaching the brush to the handle of the cultivator, covering the squares knocked off will be avoided.

Of course, in sections where there is very slight rainfall and on sandy upland soils anywhere during periods of dry and very hot weather, dependence may be placed on the heat to kill the weevil larvae in the squares.

It will seldom be safe to depend on this on alluvial soils and never on any kind of soil except under the conditions of drought and heat above noted.

HOW TO MAKE A CROP OF COTTON REGARDLESS OF THE BOLL WEEVIL.

The plan that has proved eminently successful in making a crop of cotton under boll-weevil conditions is briefly outlined as follows:

1. The destruction of the weevils in the fall by burning all rubbish and material in and about the field which might serve for hibernating quarters of the weevils.
2. Breaking (plowing) the soil as deep as conditions will allow.
3. The shallow winter cultivation of the soil if no cover crop is used.
4. Delaying the planting till the soil and temperature are warm enough to make it safe.
5. The planting of early maturing varieties of cotton.
6. The use of fertilizers.
7. Leaving more space between the rows, and on ordinary uplands having a greater distance between plants in the row than is usually allowed.
8. The use of the section harrow before and after planting and on the young cotton.
9. Intensive shallow cultivation, except under conditions noted herein.
10. Agitation of the stalks by means of brush attached to the cultivator.
11. Picking up and burning the squares that fall under weevil conditions, especially during the first 30 or 40 days of infestation.
12. Controlling the growth of the plant if excessive when young by deep and close cultivation.
13. Selecting the seed.
14. The rotation of crops and the use of legumes.

It will be noted that the system, as outlined, has a twofold object: (1) To reduce the number of weevils and (2) to aid early maturity.

The foregoing methods may require modification to suit the soil and climate. Where there is too much food and a surplus of moisture available for cotton in any soil, common sense dictates that these conditions should not be increased by deep breakings. We therefore advise the following plan under boll-weevil conditions on such lands:

Burn or thoroughly plow under all the cotton stalks as early in the fall as possible, and after the weevils have gone into winter quarters burn all the rubbish in and about the field.

In the spring, bed on the firm ground, giving sufficient space between the rows. Prepare a good seed bed before planting and maintain ridge cultivation through the season. The foregoing is especially for lands where under weevil conditions there is an excess of plant growth.

THE CORN CROP.

The average yield of corn per acre in the Southern States is very low. These averages are typical of conditions prevailing in the Gulf and South Atlantic States and show that the corn crop on an average scarcely pays the cost of production. This condition is the more humiliating because it is totally unnecessary. Under a good system of farming the corn crop of these States should show an enormous average increase.

HOW THE CROP CAN BE INCREASED.

Improve the condition and fertility of the soil by rotation of crops, by planting cowpeas or other legumes, and by the use of stable manure or compost. Plowing under green crops prior to a corn crop is of great advantage. Corn requires a deep and thoroughly pulverized seed bed. For the best results on most soils the seed bed should usually be not less than 8, 10, 12, or 14 inches deep.

For preparation of the soil for corn, see Circular No. "A"-68. Harrow occasionally to keep the soil in good tilth and conserve moisture if there is no winter cover crop. Where there is a winter cover crop break as early as possible in the spring, going to the depth usual for that field.

Use only the best selected seed obtainable. Plant as early as the season allows in rows 4 feet apart on well-drained, fairly good sandy loam soils. On rather poor uplands wide rows with a row of cowpeas in the middle of each row are preferred. On flat lands with a close subsoil wide rows and ridge planting appear to be the best; otherwise flat cultivation is preferable.

One inch is sufficient depth to plant for quick germination in a well-pulverized, moist soil, but soils and conditions are so variable that the farmer must use his judgment as to the depth of planting.

Cross-harrow before and after planting and after the corn is up to kill weeds and prevent the formation of a soil crust. Then give shallow cultivation once in every week or 10 days, and always after a rain, until it is time to lay by. For cultivation use the harrow, the weeder, flat or heel sweeps, and cultivator. Keep the middles well cultivated.

No rule that will apply in all cases can be given for depth of cultivation. If the soil has been prepared as we direct, the great body of corn roots under fair rainfall will lie from 3 to 12 inches deep and will send their feeders within 2 inches of the surface. In drier regions the roots seek more depth and when planted with a lister are still deeper. In States having 35 inches of rainfall reasonably well distributed, the evidence at hand shows that surface cultivation 2 inches deep will generally result in a larger yield of corn than deeper cultivation. The first 3 or 4 inches of soil under normal conditions are richer in available plant food than any equal space below. Preventing the corn plant, by deep cultivation, from using these richer foods simply reduces the yield.

On good soil properly prepared, cultivated, and fertilized, thin before the corn is 8 inches tall to a single stalk 15 inches in the row. When the corn is on land long in cultivation and but little fertilizer is used, 2 feet in the row will be nearer right. On very rich soils, properly prepared and tilled and progressively fertilized, the stalks may stand singly a foot apart in the row. Here the farmer must use his judgment; but if a large crop of corn is expected, there must be a good stand and more stalks left in the row than usual. The thicker stand is supported by better cultivation and fertilizing.

Never lay by the corn without planting a legume cover crop in it. Use plenty of cowpeas, velvet beans, or other suitable legumes, and when the corn is gathered the field will furnish a hay crop or a rich pasture for the stock. As soon as the cowpeas are harvested or fed deep break and sow to oats, winter barley, rye, or vetch for a winter cover, to be turned under in the spring for manure. Where the seasons are too short for this method sow crimson clover or rye and vetch at the last working of the corn crop. This does not apply to regions of light rainfall.

On rich lands and on post-oak lands nearly level and where the rainfall is heavy and ridge cultivation is used, corn rows should be 5 to 6 feet apart, and cowpeas should be planted on the side at the time of laying by.

When the ears begin to set cut out all weak or diseased stalks.

Select the seed with care and store it in a dry place.

It seldom pays to use large quantities of commercial fertilizers on corn. The corn crop requires more nitrogen than cotton. The kind of fertilizer used, the quantity, and the time of application must be determined by the soil, climate, season, and other conditions, and can not be stated in any general rule. In fact, all the foregoing directions are subject to some modification to meet conditions of climate, soil, and season. Generally a fertilizer that analyzes 9 to 10 per cent of phosphoric acid, 3 per cent of nitrogen, and 2 per cent of potash does well for corn. Well-rotted stable manure is good and produces better results if applied in the winter, so as to become incorporated with the soil. For further information on fertilizers, see Circular No. "A"-77.

The six items to be emphasized in making a corn crop are the following: (1) Good drainage; (2) soil preparation; (3) selection of seed; (4) excellent cultivation; (5) fertilization; (6) removing the tassels from bastard and inferior stalks.

A good corn crop is of great importance.

BRADFORD KNAPP,
Special Agent in Charge.

Approved:

B. T. GALLOWAY,
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